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FOREST STATISTICS FOR WHATCOM COUNTY, WASHINGTON

FROM THE FOREST SURVEY INVENTORY REVISED IN 1941

FOREST SURVEY REPORT NO. 89

U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE
PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
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PORTLAND, OREGON

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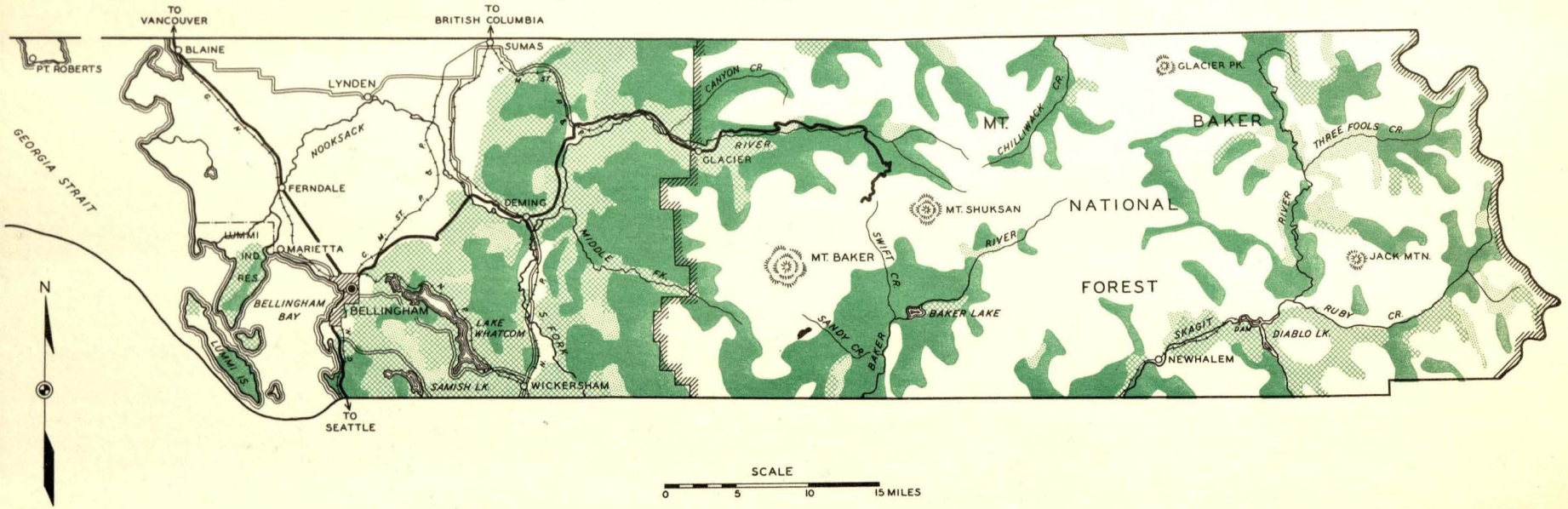
FIGURE 1

OUTLINE MAP OF WHATCOM COUNTY, WASHINGTON

1942



LEGEND

- SAW TIMBER
- SECOND GROWTH
- DEFORESTED CUTOVERS AND BURNS
- NONCOMMERCIAL FORESTS AND NON-FOREST LAND

FOREWORD

The forest survey, a Nation-wide project, consists of a detailed investigation in five major parts of present and future forest resources: (1) An inventory of the country's existing forest resources in terms of areas occupied by forest-cover types and of timber volumes, by species, in board feet and cubic feet, and a study of conditions on cut-over and on burned forest lands; (2) a study of the depletion of the forests through cutting and through loss from fire, insects, disease, and other causes; (3) a determination of the current and potential growth on forest areas; (4) an investigation of present and prospective requirements of the United States for forest products; and (5) an analysis and correlation with other economic data of findings of these studies in order to make available basic facts and guiding principles necessary to plan for sound management and use of forest resources.

The forest survey of Oregon and Washington, an activity of the Pacific Northwest Forest and Range Experiment Station, was conducted in the Douglas-fir region during the period 1930-33, inclusive.* In 1937 work of keeping the survey up to date was commenced in counties in which there had been extensive depletion since the original survey.

An inventory of the forests of Whatcom County, Washington, was first made in the summer of 1931. This inventory was later revised to adjust for cutting depletion that occurred in 1932, and in 1934 a report summarizing statistics, as of January 1, 1933, on timber volume, forest type acreages, and productive capacity of the forest land was issued. In the fall of 1941 the inventory was brought up to date through field examinations and recompilation of statistical data. In the field areas cut over during the decade 1920-29, areas cut prior to 1920 that were nonrestocked at the time of the original inventory and burned-over areas were examined to determine the condition of regeneration. Location and extent of cut-over areas logged since January 1, 1930, as reported by cut-over records, were checked and areas recently cleared for agricultural use were mapped. The ownership status of all lands was also brought up to date.

Results of the reinventory are given in this report which supersedes the one issued in 1934.

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*Oregon and Washington were divided for survey purposes into two regions, (1) Douglas-fir region, consisting of that part of both States west of the Cascade Range summit, and (2) ponderosa pine region, that part of both States east of the Cascade Range summit. A regional report which includes an interpretation of the forest survey data and analysis of the forest situation has been published for each of the two regions. Each region was divided into units--11 in the Douglas-fir region and 7 in the ponderosa pine region--for the purpose of more intensive analysis of data. It is planned to issue reports presenting findings for each unit.

FOREST STATISTICS FOR WHATCOM COUNTY, WASHINGTON

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FOREST STATISTICS FOR WHATCOM COUNTY, WASHINGTON[1]

By F. L. Moravets[2]

The influence of physiographic factors--topography, climate, and soil--has resulted in a land-use pattern in Whatcom County, Washington, comprised of three distinct zones. These three may be designated the agricultural zone, the commercial forest zone, and the noncommercial forest zone. Natural conditions within the first two have been greatly affected by nearly a century of white settlement; those within the latter are practically unchanged.

The Agricultural Zone

The extreme northwestern portion of the county, reaching eastward from Puget Sound some 18 to 25 miles and averaging 15 miles in width, is chiefly in agricultural use (figure 1). This portion, classed by the forest survey as an agricultural zone and covered by a statistical-strip method of survey in which land-use, cover-type, and timber-volume data were noted along parallel lines run across the zone at 3-mile intervals, has an area of approximately 202,000 acres or about 15 percent of the county's total land area of 1,366,370 acres.

The zone comprises the only large area of gentle topography in the county. The bulk of it is level to gently rolling. Elevations range from a few feet above sea level to 500 feet, the crest of a low mountain a few miles east of Blaine. The Nooksack River flows through the central portion between low banks, having lost most of the rush with which it left its headwaters in the mountains to the east.

Originally most of the zone was timbered; principal exceptions were the delta lands built up by silt deposits of the Nooksack River. Being near to tidewater and on favorable ground, these timber stands were the first to be logged, some shortly after the middle of the last century. Land clearing followed logging and today but 59,000 acres, or 29 percent of the zone's area, is classed as forest land by the survey. No virgin stands remain. Some 26,000 acres of the rougher lands within the zone is occupied by second-growth stands of conifers. A similar acreage is occupied by hardwoods. The conifer stands, which occur chiefly as small patches usually less than a thousand acres in size, are from 10 to 80 years old and contain a merchantable saw-timber volume of 20 million board feet. The hardwood stands, principally of the younger age classes, contain a merchantable volume of nearly 5 million board feet.

1/ Assistance in the compilation of the data contained in this report was furnished by the personnel of Work Projects Administration official project 65-2-94-144.

2/ Field work of the revised inventory of the county's forests was done by Edward D. Buell; compilation was done by W. H. Schwindel.

A total of about 6,000 acres in the zone was classed as nonrestocked cut-over land. This acreage, comprised of small tracts of stump land some of which may be grazed intermittently by livestock, was not considered to be a part of existing farms and was, therefore, mapped as forest land.

Cultivated lands and stump-pasture lands which are a part of a farm unit total 137,000 acres or 68 percent of the zone. The soil over the greater portion is of silt or sandy loam, of good depth, and well drained. Soil characteristics, a mild climate, and nearness to good markets have resulted in specialized types of agriculture and livestock production. Dairying and poultry raising are leading activities; according to statistics of the Bureau of the Census for 1940, Whatcom County had a greater number of dairy cows and chickens than any other county in the State and ranked second in the value of both dairy products and poultry products. Flower bulbs, sugar beets, vegetables, and small fruits are important crops.

The remainder of the zone, about 6,000 acres, is comprised of townsites, tidelands, and marshes.

Commercial Forest Zone

To the south and east of the agricultural zone lies a portion of the county which, because of the character of the forest growth and present ownership and use, may be termed a commercial forest zone. Roughly, it extends from the agricultural zone on the north and Bellingham Bay on the south to the western boundary of the Mount Baker National Forest and contains about 400,000 acres. One extension reaches up the North Fork Nooksack River some 15 miles into the national forest and another body lies in the Baker River drainage.

The main body of the zone is broken into several segments by the north, middle, and south forks of the Nooksack River and elongated Lake Whatcom. Each segment is dominated by a mountainous mass characterized, in general, by long even slopes and rounded crests. Bottom lands in the valleys are from one-half mile to two miles in width. Elevations within the zone extend to about 4,500 feet. Included in this zone is a peninsula that bounds Bellingham Bay on the west and two islands that lie to the southwest of the bay. Lummi, the larger island, has an area of about 5,600 acres; Eliza, the other island, is only about 160 acres in extent.

Before logging began the commercial forest zone was almost entirely forested; gravel bars, caused by the shifting of the stream bed of the Nooksack River, constituted most of the nonforest land. The narrow bottom lands, some of which were occasionally inundated by flood waters, were occupied by hardwoods, chiefly northern black cottonwood and red alder. The lower slopes up to about the 2,000-foot level were occupied principally by stands in which Douglas-fir predominated; on some of the moist situations western redcedar was the key tree. The upper slopes from approximately the 2,000- to 3,800 foot levels were clothed with mixed stands in which western hemlock comprised the bulk of the volume; associate species

included western redcedar, Pacific silver fir, western white pine, Alaska yellow-cedar, and occasionally mountain hemlock. Still higher on the slopes and on the ridges were mixed stands composed of about the same species but Pacific silver fir usually predominated. The original forest cover throughout the zone was comprised principally of old-growth stands; the relatively few breaks in the canopy caused by fires were restocked with immature stands, chiefly Douglas-fir.

Clear-cut logging has progressed over about two-fifths of the area of the commercial forest zone, chiefly in the last 3 or 4 decades. Nearly all of the old-growth Douglas-fir and a considerable part of the cedar type has been logged. However, there has been only a small amount of cutting in the second-growth Douglas-fir stands. Logging in the mixed types on the upper slopes has covered a relatively small acreage and has been confined almost entirely to stands in which western hemlock was the principal species. Second-growth stands, very largely Douglas-fir, have restocked all but a small acreage of cut-over land in the zone. Nearly all of the nonrestocked acreage has been cut over during the last decade.

Clearing of land for agriculture has been confined principally to the bottom lands along the main stream and south fork of the Nooksack River. In all, about 19,000 acres has been cleared in the zone. Because of the character of the topography and soil, it is improbable that any large additional acreage will be cleared in the future.

The bulk of the acreage in the commercial forest zone is in private ownership. The State of Washington, through original land grants and more recent acquisitions particularly of areas of second-growth timber, owns a large acreage scattered throughout the zone, both in large solid bodies of several thousand acres in extent and in small tracts of a few hundred acres. In recent years an appreciable acreage of privately owned forest land has passed into county ownership through tax delinquency and foreclosure.

Practically all of the timber in the zone can be considered physically accessible and no part lies more than 5 miles beyond the system of hard-surfaced public highways. In addition logging railroads tap several areas. Considering topography, soil, and climate, the commercial forest zone is best adapted to the production of forest products and this use will no doubt prevail.

In addition to lumbering and the limited agriculture of the valley bottoms, there is a large lime and cement plant utilizing some of the limestone deposits within the zone.

Noncommercial Forest Zone

Roughly, the noncommercial forest zone includes the eastern three-fifths of Whatcom County. Aside from the two eastward extensions of the commercial forest zone--one up the North Fork Nooksack River and the other in the Baker River Valley--this zone reaches from the western

boundary of the Mount Baker National Forest eastward to the crest of the Cascade Range, a distance of 50 to 60 miles. Within this stretch lies a bold mountainous terrain as rugged as any found in the United States. In relief the region has the appearance of an uplifted earth form that has been deeply and erratically cut into innumerable segments by the powerful force of erosion and glaciation and above which towers a multiplicity of sharp jagged peaks and ridges. Elevations range from about 750 feet along some of the streams to 10,750 feet, the crest of Mount Baker. The major part of the zone lies above the 4,000-foot level. Tributaries of the Nooksack River drain the western one-third of the zone; the Skagit River and tributaries drain all of the remainder except a portion along the northern boundary which is drained by streams flowing into Canada.

The character of the vegetative cover of a region of such altitudinal range is naturally diverse. A forest type map prepared as part of the survey[3/] clearly shows the variety of the forest cover of the zone. As indicated by the designation, noncommercial forest zone, this is chiefly a region of broad stretches of subalpine forests, smaller areas of inferior forests on poor sites below the subalpine belt, and limited stands of timber of commercial species and character that occur as narrow bands along the lower slopes rising from the deep-cut stream courses. More than a fourth of the area of the zone lies above timber line--from 4,200 to 5,000 feet. This is an alpine region comprised of mountain meadows, grass-covered slopes and ridges, solid rock faces and rock slides, and vast glacier fields. Mount Baker alone has 12 glaciers and is covered by approximately 44 square miles of ice fields.

Beginning at the lower levels of the stream courses, a band of Douglas-fir extends for a short distance up the slopes. The fir here is generally a small old-growth type--the product of a relatively poor site resulting from thin, rocky soil and a rather rigorous climate. It averages considerably smaller in diameter, shorter in length, and of poorer quality than the fir of the commercial forest zone. Immature Douglas-fir stands have restocked some of the burned-over lower slopes in this part of the county. Above the Douglas-fir in successive bands are mixed stands--first, those in which western hemlock predominates; and second, those in which Pacific silver fir usually comprises a large part of the volume. Associated species include western white pine, Alaska yellow-cedar, mountain hemlock, and infrequently alpine fir and lodgepole pine. In the aggregate the acreage of timber of merchantable quality in this zone is relatively small and is comprised of numerous scattered bodies of limited extent. They lie for the most part in steep, narrow drainages and, with the exception of those along the lower Skagit River, are remote from existing transportation facilities. For the present, practically all of the timber in this zone should be considered inaccessible.

3/ One-inch-to-the-mile county type maps and 1/4-inch-to-the-mile lithographed State type maps have been prepared to show the location and extent of the forest types. For information address Director, Pacific Northwest Forest and Range Experiment Station, 423 U. S. Court House, Portland, Ore.

In the subalpine forests such species as alpine fir, mountain hemlock, and Engelmann spruce occur, usually in clump-like stands. Although the trees in these stands are limby and gnarled and of no commercial importance, they help regulate stream flow by retarding the melting of snow and run-off. Also, the clumps of dwarfed tree growth interspersed with mountain meadows and glades add immeasurably to the scenic beauty of the region.

Primitive conditions within the noncommercial forest zone of Whatcom County have been little disturbed by man. Lying wholly within the boundaries of the Mount Baker National Forest and almost entirely in federal ownership, the resources of the zone--timber, water, minerals, forage, wildlife, and recreation--have been managed by the Forest Service under multiple-use principles. Under such management the development and use of the resources are in proportion to their relative importance and consistent with the idea of the greatest use to the greatest number of people.

Practically the only timber that has been cut in the zone has been removed in clearing operations for water-power development and limited mining operations.

Some of the vast water resource has been utilized. In 1905, a power plant with a maximum capacity of 2,300 horse power and utilizing the water run-off from 125,000 acres was installed on the North Fork Nooksack River to supply power and light to Bellingham and immediate points. Proposed enlargement of this project would create a reservoir of 220,000 acre feet and potential power of 16,700 kilowatts. On the Skagit River, the city of Seattle has been working on a large power development project since 1919. The first unit, the Gorge plant, was completed in 1924; the second, the Diablo dam and power house, was finished in 1930; and at present the Ross dam is being built. The latter dam will create a reservoir approximately 23 miles in length, impound 1,300,000 acre feet of water, and deliver an estimated total of more than a half million horse power. Drainage from nearly a half million acres of forest land will be used in this project.

Although mineral deposits of various kinds occur in the zone, mining development has been limited chiefly to gold and silver deposits. Other minerals developed to a lesser extent include copper, lead, chromite, molybdenum, and tungsten. More than 10,000 claims have been recorded in the county but, due chiefly to the general low grade of the ore and the remoteness of the region, development of all but a relatively few of the claims has been minor. Chief among the producing mines is the Azurite, located in the upper Ruby Creek drainage, which, according to the United States Bureau of Mines, led all mines in the State in 1937 in the production of gold.

Because of the inaccessibility of most of the zone, the forage resource has been little utilized. Grazing of livestock under permit has been limited to a few thousand head of sheep that are driven over the

summit of the Cascade Range from national forests in eastern Washington and to a small number of cattle and horses that graze in some of the lower valleys.

Aesthetic values, such as scenery, wildlife, and opportunities for outdoor recreation, are among the most valuable of the natural resources of the noncommercial forest zone. Here, these values are of such abundance that it has been possible to set aside vast areas in which the enjoyment of them is the paramount use. The region surrounding Mount Baker and Mount Shuksan has been set aside chiefly for recreational use. Known as the Mount Baker Recreation Area, and containing some 75,000 acres, this area has been made accessible to recreationists through a branch of the Pacific Highway leading from Bellingham to Heather Meadows. Resort and camping accommodations are available and the area is much used in summer by mountain climbing, camping, and horseback parties; in winter by skiing parties. Between Mount Shuksan and the summit of the Cascade Range and lying generally north of the Skagit River and Ruby Creek is a region of approximately 427,000 acres that is part of the North Cascade Primitive Area; the remainder of the area lies east of the summit in Okanogan County. This extremely rugged mountainous wilderness has been preserved as far as possible in its natural state; the only means of travel through the area is by trail and the only accommodations are simple trail-side shelters. Another area, designated the North Fork Nooksack Natural Area, containing 1,495 acres, was set aside in 1934 for the purpose of maintaining in their natural state stands of mature western redcedar, western hemlock, and Douglas-fir. All of the area within the Mount Baker National Forest in Whatcom County is a game refuge. Mountain goats are found in the more remote regions, and blacktail deer and black and brown bear are quite common. Among the predatory animals of the area are the cougar, bobcat, and coyote.

Land Area Statistics

Forest Land

Combined, the agricultural zone, the commercial forest zone, and the noncommercial forest zone contain a total of 1,012,015 acres of forest land, approximately 74 percent of the county's total land area. In the survey, the forest land was classified as to type and the area of each type was compiled by ownership class. Results of this classification and compilation are given in table 1.

Nonforest Land

The nonforest land was segregated into two classes: land in agricultural use, and other.

The agricultural land, nearly 156,000 acres, comprises about 11 percent of the county's land area. All but 815 acres is in private ownership. The other nonforest land, totaling about 199,000 acres, is comprised of townsites, tidelands along Puget Sound, marshes, mountain meadows, glades,

Table 1. - Area, in acres, of all forest cover types, by ownership class
Data corrected to September 15, 1941

Type No.	Type	Private	State		County	Indian	Federal			Total
			Available	Reserved 1/			National forest		Public domain	
							Available	Reserved		
	Douglas-fir									
6	Large old growth	14,650	4,535	60	1,090		6,390	730	50	27,505
7	Small old growth	1,595	795				18,390	20,490	5	41,275
8	Large second growth	28,090	5,710	605	3,945	1,920	1,810		835	42,915
9	Small second growth	43,430	2,030	215	4,175	1,400	21,295	6,940	90	79,575
10	Seedlings and saplings	40,400	9,720	390	17,645	65	5,735	2,905	820	77,680
	Western hemlock									
14	Large	22,095	13,525		2,560		42,645	28,175	230	109,230
15	Small	3,335	1,475		765		2,380	165	15	8,135
16	Seedlings and saplings	2,255	760		875		2,810	2,900	245	9,845
	Western redcedar									
17	Large	10,545	1,245		285		12,375	4,880		29,330
19	Small	305			215		780			1,300
	Fir-mountain hemlock									
23	Large	5,780	1,180		1,420		59,375	24,020	10	91,785
24	Small		5				2,825	3,895		6,725
26	Lodgepole pine, small	20					2,055	490		2,565
29	Grand fir, large	50			25					75
	Hardwood									
31.5	Large	12,545	5		240	2,215	2,130	260		17,395
31	Small	28,080	125	65	40	635	1,175	30	50	30,200
33	Subalpine	3,765	255		650		133,475	183,785	40	321,970
	Nonrestocked cut-over									
35	Cut prior to 1920	7,055	150		20					7,225
35A	Cut from 1920-29, incl.	280			330					610
36	Recent cut-over, since 1930	14,985	1,885		1,555		200			18,625
37	Deforested burn	695	20		165		16,570	18,145		35,595
38	Nonrestocked rocky area	205	5				20,760	31,485		52,455
	Total forest types	240,160	43,425	1,335	36,000	6,235	353,175	329,295	2,390	1,012,015
	Nonforest land									
3	In agricultural use	154,955	180		65	310	250		10	155,770
2	Other	13,735	75		75	410	86,060	98,130	100	198,585
	Total	408,850	43,680	1,335	36,140	6,955	439,485	427,425	2,500	1,366,370

1/ Includes 170 acres in municipal ownership.

and barrens above timber line. Only about 14,000 acres of this type of land is in private ownership, chiefly in townsites and tidelands, and the remainder is nearly all in federal ownership in the national forest.

Merchantable Saw Timber

By grouping the individual forest types into generalized classes, as in table 2, it is seen that a total of 342,000 acres or 34 percent of the forest land area, is occupied by conifer saw timber (trees 20 inches d.b.h. and larger).

Douglas-fir predominates in the merchantable stands on 112,000 acres, almost one-third of the saw-timber acreage. Stands of large old-growth Douglas-fir (type 6) cover 28,000 acres; more than half of this acreage is in private ownership. The largest body of this type, some 5,000 acres, lies on the south and west slopes of Sumas Mountain just north of the confluence of the main and south forks of the Nooksack River. Remainder of the type's acreage is comprised of a large number of small bodies. Small old-growth Douglas-fir (type 7) is found on 41,000 acres, almost entirely within the national forest; 94 percent of the acreage is federally owned. The largest contiguous body of the type, about 7,000 acres, lies along the Skagit River just north of the mouth of Ruby Creek. The timber in this body, some of which will be cut in the development of the reservoir above Ross Dam, has an outlet down the Skagit. Most of the other bodies of this type are at present remote from transportation. The total of 43,000 acres of second-growth Douglas-fir saw timber is comprised of a large number of tracts from 100 to 7,000 acres in extent. Approximately two-thirds of the acreage is privately owned and most of the remainder is owned by the State or the County. Nearly all of these stands, which are from 60 to 110 years old, are located in the lower drainage of the Nooksack River and forks and in the region southwest of Lake Whatcom and are readily accessible to highways.

Saw-timber stands of western hemlock type cover a total of 109,000 acres and lie principally on the middle and upper slopes of the mountains just outside the western boundary of the national forest and in the upper watershed of the North Fork Nooksack River. Nearly two-thirds of this type is in national-forest ownership. The principal concentration of the fir-mountain hemlock saw-timber type, which occupies 92,000 acres, is in the Baker River drainage. About 91 percent of this type's acreage is in federal ownership in the national forest.

Figure 2 graphically compares the area of saw-timber stands with the area of the other generalized forest types and also shows roughly the portion in private and public ownership.

Conifer Second Growth

Stands of second-growth conifers less than saw-timber size cover a total of 183,000 acres, a sizable acreage that has resulted from the regeneration of cut-over and burned-over lands.

Table 2. - Area, in acres, of generalized forest types, by ownership class
Data corrected to September 15, 1941

Type	Private	State		County	Indian	Federal			Total
		Available	Reserved 1/			National forest		Public domain	
						Available	Reserved		
Conifer saw timber Types 6, 7, 8, 14, 17, 23, & 29	82,805	26,990	665	9,325	1,920	140,985	78,295	1,130	342,115
Conifer second growth Types 9, 15, 19, & 24									
On cut-over areas	37,265	2,000	215	2,435	1,400				43,315
On old burns	9,625	1,505		2,675		23,825	10,840	105	48,575
Total	46,890	3,505	215	5,110	1,400	23,825	10,840	105	91,890
Conifer seedlings and saplings Types 10, 16, 19, & 24									
On cut-over areas	40,170	9,475	160	17,055	65	1,180		255	68,360
On old burns	2,665	1,010	230	1,510		10,820	5,965	810	23,010
Total	42,835	10,485	390	18,565	65	12,000	5,965	1,065	91,370
Recent cut-over areas Type 36	14,985	1,885		1,555		200			18,625
Nonrestocked cut-over and burned areas Types 35, 35A, and 37	8,030	170		515		16,570	18,145		43,430
Hardwoods Types 31 and 31.5	40,625	130	65	280	2,850	3,305	290	50	47,595
Noncommercial areas Types 26, 33, and 38	3,990	260		650		156,290	215,760	40	376,990
Total forest types	240,160	43,425	1,335	36,000	6,235	353,175	329,295	2.390	1,012,015
Nonforest land Types 2 and 3	168,690	255		140	720	86,310	98,130	110	354,355
Total	408,850	43,680	1,335	36,140	6,955	439,485	427,425	2,500	1,366,370

1/ Includes 170 acres in municipal ownership.

On a whole the restocking of cut-over lands has been satisfactory. The bulk of the early logged land lying in the northwest portion of the county was cleared for cultivation or pasture land and comprises the agricultural zone. In the commercial forest zone, the progress of logging has resulted in an appreciable acreage of immature stands on cut-over land.

As in the virgin stands that have been cut, Douglas-fir predominates in most of the second-growth stands. Of the 112,000 acres of cut-over land restocked with conifers less than saw-timber size, Douglas-fir comprises the greatest number of stems in the stands on 106,000 acres. Those in which western hemlock is the principal species cover nearly all of the remainder of the acreage.

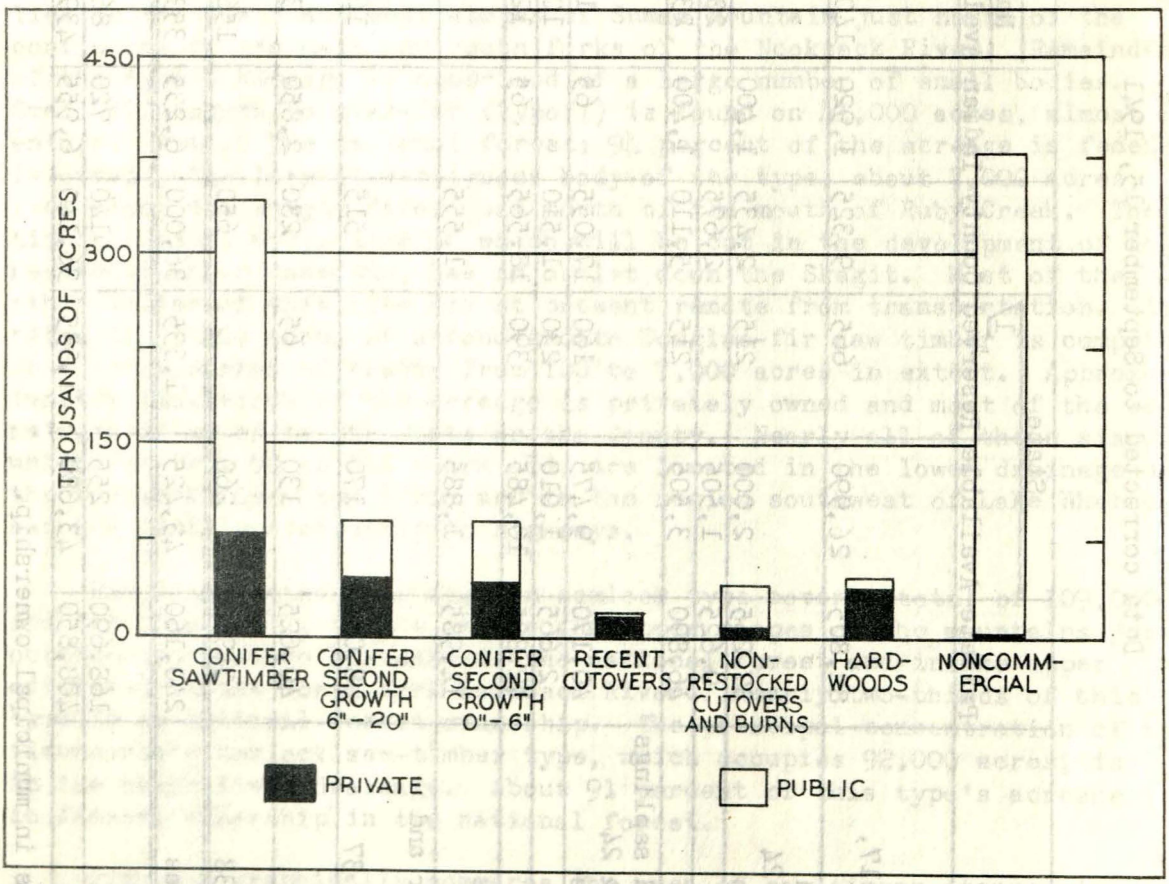

Figure 2. Generalized forest types by ownership class (from table 2).

Immature stands on burned-over areas total 71,000 acres. The major part of this acreage is within the national forest, where there are several areas of considerable extent restocked with Douglas-fir type in which the trees are from 50 to 70 years old.

As shown in table 3, which gives the area of the immature conifer types by age class and degree of stocking, a large part of the total acreage of this class of timber is occupied by stands of the younger-age classes. On nearly one-half of the acreage the stands are in either the 10- or 20-year class.

In density of stocking the second-growth stands average fairly high, especially those in the older age classes. Nearly 36 percent of the second-growth conifer acreage is well stocked (70 - 100 percent) and an additional 46 percent is of medium stocking (40 - 69 percent).

Hardwoods

Hardwood stands in Whatcom County are limited in their range. In the commercial forest zone they occur on the rich bottom lands along the larger streams, on moist situations near Lake Whatcom and Lake Samish, and on the fertile peninsula lying west of Bellingham Bay; in the agricultural zone they occupy areas adjacent to Puget Sound and some of the moist locations in the interior of the zone.

A total of 17,000 acres is occupied by hardwood stands in which the trees are of merchantable size (12 inches d.b.h. and larger). On most of this acreage the stands are composed of mixtures of red alder and northern black cottonwood or alder and bigleaf maple. About 72 percent of the merchantable hardwood acreage is in private ownership.

Immature hardwood stands, chiefly red alder, cover 30,000 acres, 97 percent of which is privately owned.

Deforested Land

Cut-over lands that have not restocked are not a problem in Whatcom County. Of the land cut over prior to 1920 that is nonrestocked, totaling 7,225 acres, 6,185 acres is comprised of relatively small areas in the agricultural zone, usually surrounded by cultivated fields or managed stump-pasture land. It is probable that a considerable part of this nonrestocked acreage will ultimately be converted to pasture or cultivated land. The 1,040 acres of this type in the commercial forest zone is in a few small tracts adjacent to or near lands in agricultural use.

Of the 27,000 acres cut during the decade 1920-29, all but 610 acres had restocked by the time of the reinventory in 1941. In none of the other 20 counties of the Douglas-fir region of western Oregon and western Washington that have been reinventoried to date has there been a smaller percentage of the area cut over during the decade 1920-29 nonrestocked at the time of reinventory.

Lands cut since the beginning of 1930 total about 19,000 acres. These lands were classified as recent cut-over areas and were not examined as to condition of regeneration since on a whole there had not been sufficient elapsed time for the areas to become restocked. The acreage

Table 3. - Area, in acres, of certain immature conifer forest types, by age class and degree of stocking
Data corrected to September 15, 1941

Age class (years)	Degree of stocking	Type number and name: 10 Douglas-fir seedlings and saplings	16 Western hemlock seedlings and saplings	9 Douglas-fir small second growth	15 Western hemlock small second growth	19 Western redcedar second growth	24 Fir-mountain hemlock second growth	Total
10	Good	4,890	940					5,830
	Medium	10,260	4,985			825	380	16,450
	Poor	9,490	755				30	10,275
	Total	24,640	6,680			825	410	32,555
20	Good	12,250	590	1,225				14,065
	Medium	23,055	2,480	310			365	26,210
	Poor	14,010		405				14,415
	Total	49,315	3,070	1,940			365	54,690
30	Good	1,430		5,020		20	65	6,535
	Medium	1,960	95	7,820	515	160	2,000	12,550
	Poor	335		1,775				2,110
	Total	3,725	95	14,615	515	180	2,065	21,195
40	Good			8,390	965		3,215	12,570
	Medium			5,970	90		145	6,205
	Poor			4,170	230			4,400
	Total			18,530	1,285		3,360	23,175
50	Good			17,545	100		395	18,040
	Medium			7,510			105	7,615
	Poor			1,330	50			1,380
	Total			26,385	150		500	27,035
60	Good			5,575	2,145	50		7,770
	Medium			2,170	50	245		2,465
	Poor			355	85			440
	Total			8,100	2,280	295		10,675
70	Good			170				170
	Medium			8,530	60			8,590
	Poor							
	Total			8,700	60			8,760
80	Good			765	490			1,255
	Medium			540	2,855		25	3,420
	Poor							
	Total			1,305	3,345		25	4,675
90+	Good				5			5
	Medium				495			495
	Poor							
	Total				500			500
Total all ages	Good	18,570	1,530	38,690	3,705	70	3,675	66,240
	Medium	35,275	7,560	32,850	4,065	1,230	3,020	84,000
	Poor	23,835	755	8,035	365		30	33,020
	Total	77,680	9,845	79,575	8,135	1,300	6,725	183,260

of this type is in some half dozen tracts of 1,000 to 3,000 acres in extent and a number of smaller tracts of a few hundred acres. All are within the commercial forest zone.

Areas deforested by fire that have not restocked are limited almost entirely to the rough and inaccessible eastern portion of the county where lightning fires have swept over steep rocky slopes. More than half of the total of 36,000 acres is in the North Cascade Primitive Area.

Noncommercial Forests

The subalpine forests, areas of inferior tree growth on sterile sites below the subalpine zone, and lodgepole pine timber of dwarfed growth were classed as noncommercial forests. They cover 377,000 acres or 28 percent of the county's land surface and 37 percent of the forest-land area. All but about 5,000 acres is in national-forest ownership and nearly three-fifths of the total acreage is in the North Cascade Primitive Area.

Productive Capacity of Forest Land

One phase of the survey of the forests of the county was a classification of the productive capacity of the commercial forest land. In this classification, results of which are given in table 4, 330,000 acres was rated on capacity to grow Douglas-fir or western redcedar types and 257,000 acres on capacity to grow western hemlock and fir-mountain hemlock types.

The lands rated by the Douglas-fir classification include the lower-lying areas of the western portion of the county and the more fertile valley bottoms of the eastern portion. They are about of average productivity; 70 percent of the acreage so rated is in site quality class III or better. Lands rated by the hemlock classification include the slopes and ridges of the rougher portion of the county, a region of thin rocky soils and more or less rigorous climate. Consequently they average low in productivity. Only about 27 percent of the area rated by this classification is in site quality class III or better.

Timber Volume Statistics

Another measure of the extent of the county's forest resource is the merchantable saw-timber volume. The reinventory showed a total of 9 billion board feet, log scale, Scribner rule. The volume in each of the 12 conifer and 4 hardwood species that attain merchantable size and quality in the county is shown by ownership class in table 5. The proportionate amount of the major species and the volume in private and public ownership is graphically presented in figure 3.

The volume of Douglas-fir, the species that has furnished the vast bulk of the sawlogs during several decades of logging operations in the western portion of the county, has been reduced to 2.5 billion feet. Remaining fir volume in large old-growth trees (more than 40 inches d.b.h.)

Table 4. - Land areas, forest land areas, and commercial conifer areas by site quality class 1/
Data corrected to September 15, 1941

Kind of forest land and site quality class	Total area		Area in forest land	Area in commercial conifers
	Acres	Percent	Percent	Percent
Commercial conifer				
Douglas-fir				
Class I	580)	1.5	0.1	0.1
Class II	20,335)		2.0	3.5
Class III	212,495	15.6	21.0	36.2
Class IV	89,340	6.5	8.8	15.2
Class V	7,115	0.5	0.7	1.2
Total	329,865	24.1	32.6	56.2
Spruce-hemlock				
Class I				
Class II	920)	5.1	0.1	0.1
Class III	68,720)		6.8	11.7
Class IV	177,830	13.0	17.6	30.3
Class V	10,095	0.8	0.9	1.7
Total	257,565	18.9	25.4	43.8
Total commercial conifer	587,430	43.0	58.0	100.0
Lodgepole pine	2,565	0.2	0.3	
Subalpine	321,970	23.6	31.8	
Noncommercial rocky	52,455	3.8	5.2	
Hardwood	47,595	3.5	4.7	
Total other	424,585	31.1	42.0	
All forest land	1,012,015	74.1	100.0	
Nonforest land	354,355	25.9		
Grand total	1,366,370	100.0		

1/ The "site quality" of a forest area is its relative productive capacity, determined by climatic, soil, topographic, and other factors. The index of site quality is the average height of the dominant stand at the age of 100 years. Five site quality classes are recognized for both Douglas-fir and spruce-hemlock types, Class I being the highest. In the survey, Douglas-fir classifications were used for Douglas-fir and western redcedar types; spruce-hemlock classifications were used for Sitka spruce, western hemlock, and fir-mountain hemlock types.

Table 5. - Volume of timber by species and ownership class
Data corrected to September 15, 1941

Trees 16" and more d.b.h.[1]
Thousands of board feet, log scale, Scribner rule

Species	Private	State		County	Indian	Federal			Total
		Available	Reserved[2]			National forest		Public domain	
						Available	Reserved		
Douglas-fir									
Large old growth	370,950	108,528	436	21,190	23	251,907	42,924	1,716	797,674
Small old growth	113,934	39,008	155	6,198		398,250	336,728	303	894,576
Large second growth	423,888	96,428	15,339	64,783	11,276	5,697	3,450	11,763	632,624
Small second growth	84,212	16,469	74	9,784	2,912	65,925	12,592	28	191,996
Sitka spruce, large	3,879	1,848	4	309		165		6	6,211
Engelmann spruce	11					3,957	26,888		30,856
Western hemlock									
Large	760,831	276,398		86,920		1,071,301	542,247	4,270	2,741,967
Small	204,313	70,795		19,763		15,906	2,328	493	313,598
Mountain hemlock	354			6		29,943	3,318		33,621
Western redcedar									
Live	327,144	85,081	200	17,099		530,803	173,117	454	1,133,898
Dead	15,334	4,292	16	1,014		30,765	5,531	2	56,954
Alaska yellow-cedar	4,401	1,554		798		12,583	7,373	17	26,726
Western white pine	14,899	4,139	14	1,366		21,585	22,423	17	64,443
Lodgepole pine						34	28		62
Pacific silver fir	309,243	122,823	15	53,526		1,058,425	434,990	1,347	1,980,369
Grand fir	350			360		7,952	1,351		10,013
Alpine fir	50	51							101
Red alder	21,058	766	2	492	26,704	5,431	1,718	4	56,175
Bigleaf maple	9,901	1,726	5	504	3,239	2,588	1,955	12	19,930
Northern black cottonwood	6,868				1,607	16,011	1,089		25,575
Western paper birch						158			158
Total	2,671,620	829,906	16,260	284,112	45,761	3,529,386	1,620,050	20,432	9,017,527

1/ Trees of hardwood species taken from 12" and more d.b.h.
2/ Includes 10 thousand board feet of small second-growth Douglas-fir in municipal ownership.

the most valuable class of timber in the county, is slightly less than 0.8 billion feet. The volume in small old-growth fir (20 to 40 inches d.b.h.) is nearly 0.9 billion feet. Since this class of fir occurs principally in the inaccessible eastern part of the county, only a relatively small amount of it has been logged to date. The remainder of the fir volume, about 0.8 billion feet, is in thrifty growing second-growth trees. The volume of western redcedar, a species that has been utilized extensively here as it was a common component of the stands that have been cut, is 1.2 billion feet, a large portion of which is at present remote from logging operations. Likewise remote is the bulk of the 3 billion feet of western hemlock and 2 billion feet of balsam firs.

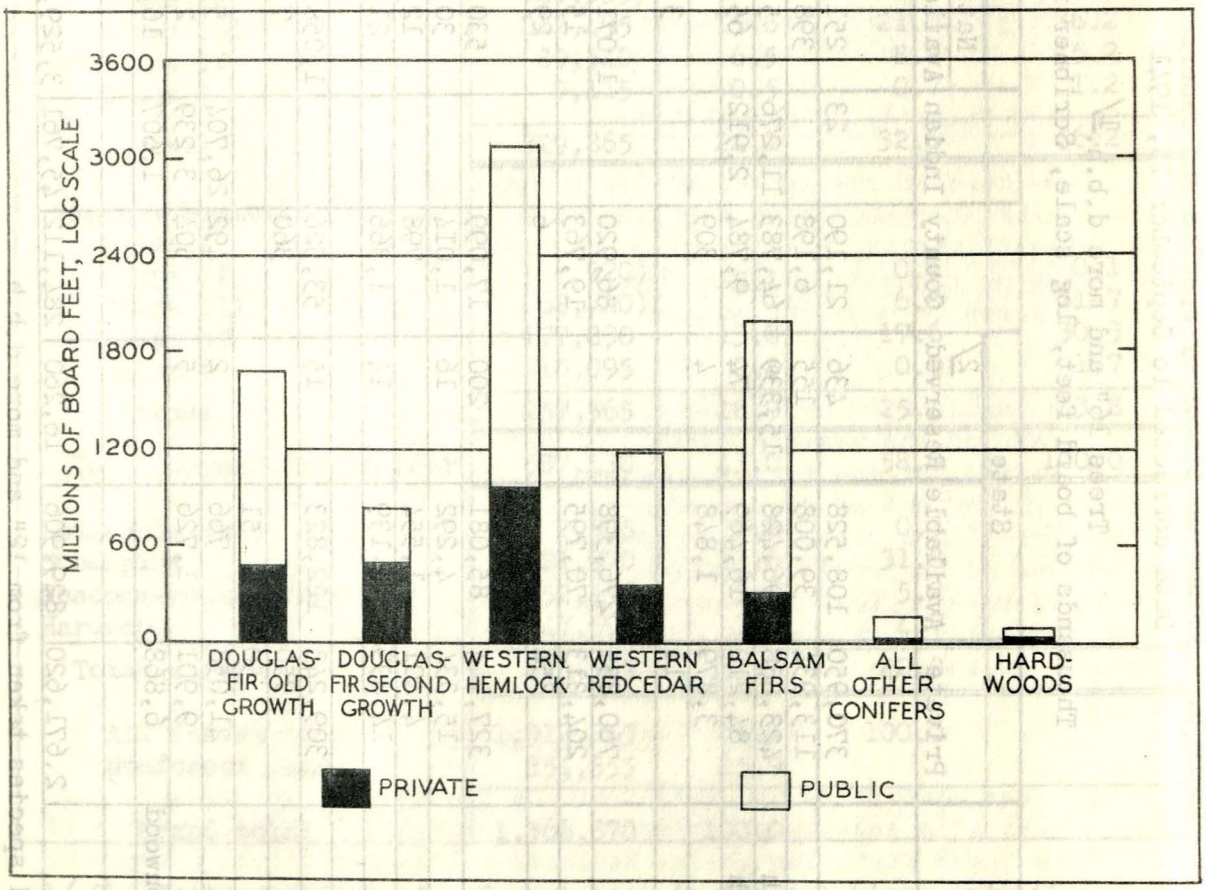

Figure 3. Distribution of saw-timber volume by species group (from table 5).

Merchantable volume in private ownership amounts to 2.7 billion feet, about 30 percent of the total. Of the 5.1 billion feet in federal ownership, about one-third is in the North Cascade Primitive Area.

Forest Utilization

The forests of Whatcom County have had a vital role in the development of the huge lumbering industry of the Puget Sound region. As in other northwestern Washington counties fronting on the Sound, virgin forests of old-growth Douglas-fir and western redcedar of large size and high quality, on favorable logging ground and near to tidewater, furnished the raw material for a steadily growing industry that expanded from the time of the earliest white settlers until the busy latter half of the decade 1920-29.

Statistics on the volume of sawlogs cut in the county prior to 1925 are not available, but the large area of cleared land in the northwestern portion and the age of second-growth stands on restocked lands indicate that the major portion of the cut-over acreage was logged prior to this date and that cutting was particularly heavy in the last two preceding decades. However, it is probable that in no prior year was the production of sawlogs greater than in 1925 when a total of 142 million board feet was cut. Beginning in 1926, production began to decline, slowly for the first four years, then rapidly during the next three years--the period of depressed economic conditions. Since 1932 the trend has been upward except in 1938 and the volume of logs produced in 1940 and 1941 exceeded slightly the 1926 cut. Average production for the 17-year period 1925-41 was about 87 million board feet.

An additional volume of timber was cut in the form of the so-called minor products--fuelwood, shingle bolts, poles, piling, posts, and pulpwood. The total volume cut in the form of these products from trees of saw-timber size was estimated in 1930 at approximately 14 million board feet.4/ The volume cut from trees of less than saw-timber size was about 3.5 million cubic feet.

The timber cut in Whatcom County as sawlogs, shingle bolts, and pulpwood has been utilized by local manufacturing plants, and in earlier years comprised the principal source of raw material for the plants. However, more recently some of the larger sawmills and a pulp plant have had to go outside the county for sawlogs. During the last two decades large quantities of sawlogs have been imported from Skagit County by rail and by water from Clallam County on the Olympic Peninsula and British Columbia.

During the peak years of the decade 1920-29, the forest-products industry consisted of some two dozen sawmills with a total rated 8-hour capacity of nearly 2 million board feet, a pulp plant of about 50-ton capacity and a small paper plant, both built in 1926, a number of shingle mills several of which were operated in connection with a sawmill,

4/ Johnson, Herman M. The Production and Consumption of Minor Products in Oregon and Washington. Office report, Pacific Northwest Forest and Range Experiment Station. 1931.

and a number of woodworking plants. During the next decade and a half, several of the sawmills were dismantled either because of lack of sawlogs or obsolescence and total capacity was more than halved. However, the pulp industry in the county expanded; the present pulp plant has a 24-hour rated capacity of nearly 500 tons. According to Bureau of the Census statistics on population for 1940, approximately 2,500 persons were employed in the county in logging, sawmills and planing mills, pulp and paper plants, and miscellaneous woodworking plants.

The forest products industry centers at Bellingham which through its location on Bellingham Bay has deep-sea shipping facilities. The larger sawmills, the pulp industry, and a plywood plant are located here. In addition to these industries, there are large fish canneries, creameries and other food-processing plants, coal mines, and cement and lime plants located in or near the city, making it one of the industrial centers of western Washington. A population of 29,314 in 1940 ranked Bellingham as the fifth largest city in the State.

Forest Replenishment

Offsetting to a degree the drain on the forests of the county through the cutting of sawlogs and other products--a total volume that averaged slightly more than 100 million board feet during the 17-year period 1925-41--and loss through fire, insects, wind throw, and disease, which in recent years has been relatively light, is the annual replenishment through forest growth. An estimated rate at which this replenishment is taking place in the commercial forests of the county was compiled from data obtained in the reinventory in 1941.

Current annual growth was computed on conifer stands occupying a total of 238,000 acres. These stands were less than about 150 years old. It was assumed that net growth on older stands is offset by net loss in overmature stands. Of the area of growing stands, about 201,000 acres is occupied by Douglas-fir types, 29,000 acres by hemlock types, 7,000 acres by fir-mountain hemlock type, and 1,000 acres by western redcedar type.

The total current annual growth on conifer trees 15.1 inches or more d.b.h. was computed to be 38.4 million board feet and on trees 5.1 inches or more d.b.h. 19.0 million cubic feet. These calculated increments are shown by forest type in table 6.

The current annual growth on immature hardwood types was calculated to be 2.7 million board feet and 1.6 million cubic feet. Combined the growing conifer and hardwood stands are calculated to be putting on a net annual increment of 41 million board feet, in round figures, or about two-fifths of the average annual volume cut during the last 17 years.

As the old-growth stands are logged and then replaced by growing stands, the current annual growth rate will increase--a prediction that presumes that the old growth is cut in a manner to assure regeneration and that the immature stands are given adequate protection from fire.

Table 6.--Current annual conifer growth by forest types.

Type	Current annual volume growth on	
	Trees 15.1 inches or more d.b.h.	Trees 5.1 inches or more d.b.h.
	Thousand board feet	Thousand cubic feet
Douglas-fir	26,581	15,645
Western hemlock	11,637	2,458
Fir-mountain hemlock	56	814
Western redcedar	115	49
Total	38,389	18,966

Comparison of Inventories

Another way to determine the trend of forest utilization and replenishment in the county is to compare results of the reinventory of 1941 with those of the original inventory of 1932. This comparison follows:

	1932	1941	Change, percent
Area of forest land	1,013 M acres	1,012 M acres	- 0.08
Saw-timber area	270 M acres	240 M acres	-11.0
Conifer second growth 6-20 inches d.b.h.	86 M acres	92 M acres	+ 7.0
Conifer second growth 0-6 inches d.b.h.	60 M acres	91 M acres	+51.7
Saw-timber volume	9,330 million bd. ft.	9,018 million bd ft.	- 3.3
Douglas-fir volume, all sizes	2,609 million bd. ft.	2,517 million bd. ft.	- 3.5
Douglas-fir, large old growth	1,025 million bd. ft.	798 million bd. ft.	-22.1

The above percentages of change do not indicate a serious trend in the forest situation in the county. The decrease in area of saw-timber stands is not large and the increase in area of second-growth stands is encouraging. The 51-percent increase in the area of the seedling and sapling stands, 0-6 inches d.b.h., emphasizes the satisfactory regeneration of cut-over lands.

The small decrease in saw-timber volume does not quite give the true ratio between drain and increment during the 10-year interval between inventories. In the reinventory the merchantable volume contained in second-growth stands inside the national forest was recomputed and some 90 million board feet additional volume resulted. The 22-percent decrease in volume of large old-growth Douglas-fir indicates the concentration of cutting very largely in this class of timber.

Analysis of statistics on ownership shows that the forest-land area in private ownership decreased 11 percent during the period between inventories; privately owned saw-timber acreage decreased 21 percent and saw-timber volume about 20 percent.

Conclusion

Although Whatcom County still has a timber supply of 9 billion board feet, the bulk of it is in stands on rough mountainous topography and a large part is remote from existing transportation. Cutting has been confined to the western one-third of the county, a region of more gentle topography and near tidewater. It has also been concentrated chiefly in stands of large old-growth Douglas-fir and the volume of this class of timber has been reduced to 0.8 billion board feet.

The forest-products industry has been extensively developed in the county and annually consumes a greater volume of logs than is cut locally. Any expansion of the industry should be in the pulp and paper plants since about 55 percent of the merchantable volume is western hemlock and balsam firs, species suitable for pulp.

The cut-over lands are in good condition; those logged in the earlier years of the lumber industry and not cleared for agricultural use are almost all restocked; those logged in more recent years are likewise largely restocked with stands of a satisfactory density of stocking. However, the major portion of the forest-land acreage in the county is of a relatively low productive capacity.

A large part of the forest-land acreage in the eastern two-thirds of the county is covered with forests of noncommercial character. In addition to protecting the watersheds, they are an integral part of the scenic beauty of the region, much of which is at present included in recreational and wilderness areas.